

Having thus described the invention, we claim:

CLAIMS

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1. A method for coating an outer surface of a product roller for an electrophotographic process with a seamless coating of a surface-modifying material, the method comprising:

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- a) applying a mixture containing the surface-modifying material to a rotatable gravure roller;
- b) rotating the product roller; and,
- c) rotating the gravure roller in mixture-transferring contact with the product roller transferring at least a portion of the mixture to the product roller.

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2. The method of Claim 1 wherein transfer of the mixture to the product roller is continued by continuing application of the surface-modifying material to the gravure roller and continuing rotation of the product roller until a selected quantity of surface-modifying material has been transferred to the outer surface of the product roller.

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3. The method of Claim 1 wherein the mixture of the surface modifying-material is a mixture or dispersion of the surface-modifying material in a volatile solvent.

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4. The method of Claim 2 wherein the surface-modifying material is selected from the group consisting of tetrafluoroethylene, fluorinated ethylene-propylene resins, polymers of chlorofluoro-ethylene, polyvinylidene fluoride, hexafluoropropylene, co-polymers of vinylidene fluoride and hexafluoropropylene.

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5. The method of Claim 3 wherein the volatile solvent is a ketone having a boiling point at standard atmospheric pressure from about 50 to about 160°C.

6. The method of Claim 1 wherein the mixture contains water or a blend of water with organic solvents and the surface-modifying material.

7. The method of Claim 1 wherein the mixture is applied to the gravure roller by  
5 immersing a portion of the gravure roller in the mixture.

8. The method of Claim 1 wherein the mixture is applied to the gravure roller by spraying the mixture onto the gravure roller.

10 9. The method of Claim 1 wherein the product roller is a fuser roller, pressure roller, oil donor roller, intermediate transfer roller, primary charge roller, or a paper or other substrate handling roller.

10. The method of Claim 1 wherein the gravure roller is in mixture-transferring  
15 contact with the product roller by mixture-transferring contact with an intermediate roller with the intermediate roller being in mixture-transferring contact with the product roller.

11. A method for coating an outer surface of a product roller for an electrophotographic process with a seamless coating of a surface-modifying material, the  
20 method comprising:

a) positioning the product roller in surface-modifying material transfer contact with an application roller having a central axis and an outer surface and rotating the product roller and the application roller;

b) positioning a metering roller having a central axis and an outer surface and a  
25 central axis above and horizontally displaced from the central axis of the application roller so that a mixture containing the surface-modifying reservoir space is formed between the metering roller and the application roller and so that a selected spacing is present between the outer surface of the metering roller and the outer surface of the application roller; and,

c) rotating the metering roller in an opposite direction to the rotation of the application roller to position a selected quantity of the mixture containing the surface-modifying material on the outer surface of the application roller so that at least a portion of the quantity of the mixture containing surface-modifying material is transferred to the product roller.

12. The method of Claim 11 wherein transfer of the mixture to the product roller is continued by continuing application of the surface-modifying material to the gravure roller and continuing rotation of the product roller until a selected quantity of surface-modifying material has been transferred to the outer surface of the product roller.

13. The method of Claim 11 wherein the mixture containing the surface modifying-material is a mixture or dispersion of the surface-modifying material in a volatile solvent.

14. The method of Claim 12 wherein the surface-modifying material is selected from the group consisting of tetrafluoroethylene, fluorinated ethylene-propylene resins, polymers of chlorofluoro-ethylene, polyvinylidene fluoride, hexafluoropropylene, copolymers of vinylidene fluoride and hexafluoropropylene.

15. The method of Claim 13 wherein the solvent is a ketone having a boiling point at standard atmospheric pressure from about 50 to about 160°C.

16. The method of Claim 11 wherein the mixture contains water or a blend of water with organic solvents and the surface-modifying material.

17. A method for coating an outer surface of a product roller for an electrophotographic process with a seamless coating of a surface-modifying material, the method comprising:

a) rotating the product roller; and,  
b) applying a mixture containing the surface-modifying material to the outer surface of the product roller at a controlled rate.

5           18. The method of Claim 17 wherein transfer of the mixture to the product roller is continued by continuing application of the surface-modifying material to the gravure roller and continuing rotation of the product roller until a selected quantity of surface-modifying material has been transferred to the outer surface of the product roller.

10           19. The method of Claim 17 wherein the mixture of the surface modifying-material is a mixture or dispersion of the surface-modifying material in a volatile solvent.

            20. The method of Claim 19 wherein the surface-modifying material is selected from the group consisting of tetrafluoroethylene, fluorinated ethylene-propylene, resins,  
15           polymers of chlorofluoro-ethylene, polyvinylidene fluoride, hexafluoropropylene, co-polymers of vinylidene fluoride and hexafluoropropylene.

            21. The method of Claim 19 wherein the solvent is a ketone having a boiling point at standard atmospheric pressure from 50 to about 160°C.

20           22. The method of Claim 17 wherein the mixture contains water or a blend of water with organic solvents and the surface-modifying material.

            23. The method of Claim 17 wherein the mixture is ejected onto the outer surface  
25           of the product roller by using a slot die.

            24. The method of Claim 17 wherein the mixture is applied at a selected rate as a falling curtain or ribbon of the mixture onto the product roller.

25. The method of Claim 17 wherein the mixture is applied to the product roller as a jet or as a spray.

26. A method for coating an outer surface of a product roller for an  
5 electrophotographic process with a seamless coating of a surface-modifying material, the method comprising:  
a) providing a mixture containing the surface-modifying material;  
b) immersing the outer surface of the product roller in the mixture; and,  
c) withdrawing the product roller from the mixture at a controlled rate.

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27. The method of Claim 26 wherein the mixture containing the surface modifying-material is a mixture or dispersion of the surface-modifying material in a volatile solvent.

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28. The method of Claim 27 wherein the surface-modifying material is selected from the group consisting of tetrafluoroethylene, fluorinated ethylene-propylene resins, polymers of chlorofluoro-ethylene, polyvinylidene fluoride, hexafluoropropylene, co-polymers of vinylidene fluoride and hexafluoropropylene.

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29. The method of Claim 28 wherein the solvent is a ketone having a boiling point at standard atmospheric pressure from 50 to about 160°C.

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30. The method of Claim 26 wherein the concentration of the surface-modifying material in the mixture is adjusted to a concentration sufficient to provide a desired quantity of the surface-modifying material on the outer surface of the product roller upon withdrawing the product roller.

31. A method for coating a product roller for a electrophotographic process with a seamless coating of a surface-modifying material by a wet-on-wet method, the method comprising:

- 5           a) depositing a first coating of a mixture containing the surface-modifying materials on an exterior of the product roller; and,
- b) depositing at least one subsequent coating of the mixture onto the exterior o the product roller prior to drying the first coating.